MEMORANDUM

Date:	November 25, 2009	**TG:**	08301.00
To:	Technical Review Committee Members		
From:	Project Team		
Subject:	Level 2 Screening – Preliminary Results		

This memorandum summarizes the findings of the Level 2 screening results prepared by the project team. This memorandum includes level of service (LOS) calculations for baseline and improvement scenarios as well as a summary of benefits and limitations for each of the concepts. The project team is seeking feedback from the Technical Review Committee (TRC) on these screening results to narrow the range of improvement alternatives for further evaluation.

Background / Purpose

As discussed at the previous TRC meeting and communicated in subsequent material, the development of improvement concepts is focused on four interchanges. The four interchanges include:

- Dupont-Steilacoom Road (Exit 119)
- 41st Division Drive (Exit 120)
- Berkley Street (Exit 122)
- Thorne Lane (Exit 123)

Since the draft interchange concepts were presented to the Technical Review Committee (TRC), the project team has been conducting more detailed analyses of the operational impacts and geometric constraints for each of the improvement concepts. In addition to the analysis of specific interchange improvements, additional consideration was given to the impact of system wide concepts, including mainline I-5 improvements. The following provides a brief overview of potential system wide concepts and related benefits as well as an overview of interchange concepts and their related benefits.

Future Baseline Evaluation

The analysis to-date of both the existing year and future baseline (2030) year results indicates one clear issue; the demand for travel on I-5 through the study area is high today and will continue increasing into the future. As demonstrated in the existing conditions analysis, key segments in the corridor experience traffic volume demands exceeding available roadway capacity. Thus, it is clear that as population and employment increases into the future, demand for travel on I-5 will increase, resulting in increased congestion at additional segments and for longer periods of time. As identified in the existing conditions report, most segments, merge, and diverge sections are currently operation at/near capacity.

Exhibit 1 summarizes the results of the 2030 baseline LOS analyses for the mainline, merge, and diverge operations within the full study area of the project. As shown in the exhibit, all segments of I-5 in the northbound direction are anticipated to operate at LOS E or worse with the exception of the northbound merge at Gravelly Lake Boulevard and Bridgeport Way. In the southbound direction, south of Thorne Lane, all segments and merge/diverge operations are anticipated to operate at LOS E or worse with the exception of merge from Berkley Street or diverge at Center Drive.

As illustrated in the baseline LOS analysis (Exhibit 1), demand for travel of I-5 is forecasted to exceed the capacity of the freeway by 2030 for the segment of I-5 through the majority of the study

area. In general, demands along I-5 in the future exceed the current capacity by approximately 1,500 to 2,200 vehicles during the PM peak hour. This is the equivalent of over another full lane of freeway capacity. Exhibits 2a and 2b summarize the 2030 turning movement counts at the ramp terminals.

System Concepts

While the Level 1 screening highlighted the interchanges that will be evaluated at a more detailed level, there is still the need to evaluate and consider system wide concepts that would help address the overall demand along the I-5 corridor and/or provide alternative travel choices. It is important to understand how system wide concepts may change the need for improvements at the interchanges themselves or whether they are needed in addition to the interchange improvements. Therefore, the project team reviewed and evaluated five general system wide concepts. They include:

- **Intelligent Transportation System (ITS) Improvements** - to improve the efficiency of the system.
- **Demand Management** - to lessen the demand for single occupant vehicle traffic.
- **Transit System Improvements** - to improve travel options for users along the corridor.
- **I-5 Mainline Improvements** – to increase capacity on the I-5 corridor.
- **Parallel Corridor Improvements** – to lessen the amount of demand destined for I-5 by constructing or improving other parallel facilities, such as SR 507 and SR 7.

Below is a summary of the initial findings regarding each of the system concepts.

ITS Improvements

WSDOT is committed to using whatever tools are available to operate the system as efficiently as possible, including technology. WSDOT has plans to improve the ITS infrastructure from Mounts Road to north of SR 512. This includes adding closed circuit cameras, increased traveler information systems, variable message signs and ramp metering at strategic locations throughout the corridor. These improvements will be included in the final study recommendations and will help provide the traveling public with more information on travel conditions as well as ways to improve the flow of traffic along I-5.

The ITS improvements are considered a first step in any improvement strategy for I-5 and are an integral part of WSDOT's Moving Washington Plan. ITS improvements can help improve the overall efficiency of the network. Ramp meters have been shown to improve traffic flow anywhere from 2% to 10% depending on their location and method of application. If a 5% improvement in efficiency is assumed, the I-5 corridor could conceivably accommodate another 300 to 500 vehicles. This increase in efficiency is still far less than the expected demand and has impacts on the local arterials and connections.

Demand Management

Traffic is increasing on I-5 because more people are living and working in the region. The current long range plans all assume some basic level of population and employment growth for our region. Growth is considered an integral part of a healthy economy. This stretch of I-5 is impacted by population growth in Thurston and Pierce counties, the military bases, and also growth in Washington, Oregon, and California. As the region continues to grow, the need to travel between each region along I-5 also increases.

The region recognizes that alternative modes of travel are an important consideration when evaluating improvement needs. In 2009, almost 10,000 people travel out of the three military installations along I-5 in the peak hour alone. This is forecasted to grow to over 12,000 by the year 2030. A majority of these trips access I-5 at some point. A freeway lane can handle approximately

2,000 vehicles per hour. This means that the demand leaving the three bases could fill up 6 lanes of freeway by themselves.
By continuing to encourage vanpools, high occupancy travel modes and flexible work schedules, a small reduction in the total peak hour demand on the freeway could be expected. However, due to the nature of operations on a military installation, most of the reduction would be from non-military traffic. If a 10% reduction in non-military trips were obtained, the demand of PM Peak hour trips would be reduced by 400 vehicles. This reduction in demand is very optimistic and still does not address to overall congestion issues along the corridor and in and of itself would not have a meaningful impact on reducing the levels of congestion in the corridor.

Transit Improvements

Transit can play an important role in addressing travel demand along I-5. One system level alternative tested was to extend the Sounder Commuter rail line from its currently planned terminus in Lakewood south to DuPont. This extension resulted in approximately 135 riders in the AM Peak hour going northbound towards Tacoma and Seattle. The forecast for the AM bus ridership between Thurston County and Pierce County is approximately 500 riders. Without these transit services in place, an additional 600 people would be trying to use this section of I-5. However, bus routes must also use the same freeway lanes as single occupant vehicles. To expect an even larger shift to buses may be unrealistic until such time that there is travel time benefit over single occupant vehicles.

Pierce County and Fort Lewis are currently in the process of assessing the demand and viability of increased transit service to the installation. Currently routes do access the installation with security procedures addressed at the gates. Attracting additional transit users to and from the military installations is a challenge due to the rigid scheduling of military activities and the limitations of serving a secured area.

I-5 Mainline Improvements

As noted, the increase in demand on I-5 exceeds the available capacity. By 2030, the demand for travel in the PM Peak hour is forecasted to exceed the ability of the freeway to accommodate it, especially in the peak directions. Along some segments, the forecast for demand is almost 30% higher than the available capacity. In situations such as these, the most likely outcome is that the PM Peak hour will spill over into the shoulder periods and the peak will spread.

One sensitivity test was run through the travel demand model to determine if an additional lane would meet the capacity constraints along the corridor. The existing add/drop lane at Thorne Lane was extended to Mounts Road for the analysis. In general, the widening of I-5 did not result in an increase in demand. The corridor is still largely capacity constrained due to the bridges over the Nisqually River south of Mounts Road. Therefore very little additional “latent” demand was observed when a new lane was added. This resulted in the additional lane reducing the overall I-5 mainline volume to capacity (v/c) ratios to at or below 1.0. Anything less than a v/c of 1.0 indicates the freeway demand is below the available capacity.

Although widening of I-5 would improve the flow of the mainline, it would not address operational issues at the arterial intersections at each of the ramp terminals. In general, most of the improvements that would be proposed at each interchange are not affected with the widening of I-5. With the close proximity of the rail line to I-5, any widening of I-5 would require widening to the east of I-5.

New Parallel Corridor

I-5 is the main connection between Pierce and Thurston Counties. Travel between Seattle and Olympia travels on I-5, often no matter how unfavorable the traffic conditions. With this in mind, the project team evaluated the possible benefits a parallel facility could have on I-5. The parallel facility

tested was a new limited access facility, comparable to the existing I-5 corridor, with 3 travel lanes in each direction and a posted speed limit of 60mph. The facility was coded in the vicinity of SR 507 and SR 7 and ran from Thurston County north to I-5 in Tacoma. The evaluation was simply a "modeling exercise" meant to understand whether a new freeway corridor would alleviate needs along I-5.

In general, the results of the analysis showed that although the parallel facility could remove some traffic from I-5, the majority of trips between Thurston County and Pierce County would still remain on I-5 itself due to the overall destinations of the trips. The parallel facility lowered traffic volumes on I-5 a total of 5% at the lowest point of change and almost 13% at its highest point. This resulted in a shift of approximately 500 to 1,000 vehicles in the PM Peak hour (2030) from I-5. Thus, the PM Peak travel demand on the parallel facility would be closer to levels experienced on I-5 today; however the parallel corridor would in and of itself not alleviate congestion from I-5. Therefore, there is still a need for further improvements or traffic reductions on I-5. This, combined with the environmental, cost and neighborhood impacts that a new parallel facility would likely have, make this a parallel facility less desirable than widening of I-5 itself.

Interchange Improvement Concepts

As identified in the previous baseline discussion, without additional improvements to the I-5 mainline, the improvements to the interchanges will not be as effective. As part of the refined analysis to be conducted on the "preferred" alternative, additional analysis will be conducted focusing on the merge/diverge operations associated with each of the improvement concepts. Specifically, the project team will assess and determine whether collector/distributor lanes or auxiliary lanes should be constructed along the I-5 mainline. The overall recommendation regarding the mainline improvements is based on the system needs as well as the individual interchange operations.

The concepts presented in this section have not defined the mainline treatments at this point. In general three concepts, with the exception of 41st Division Drive, were developed for each interchange. The multiple concepts were developed focusing on near term and long term solutions. Based on geographical constraints and existing/future deficiencies, short-term improvements were more easily defined for some interchanges than others. Exhibits 3 through 6 include an illustration of the improvement, a summary of the existing/future baseline deficiencies, as well as the benefits and limitations for each concept. Table 1 provides a summary of the key interchanges, baseline conditions and LOS under the improvement concepts.

Table 1. Future (2030) Weekday PM Peak Hour LOS & Delay Summary

Interchange	Key Movement(s)	Terminal	Baseline	Concept A	Concept B	Concept C
DuPont-Steilacoom Rd (Exit 119)	Outbound Fort Lewis to SB I-5	SB Ramps NB Ramps	F/ >180 F/ >180	B/ 14 C/ 27	C/ 30[2]	B/ 18 C/ 24
41st Division Dr (Exit 120)	On-ramp merge points onto NB & SB I-5	SB Ramps NB Ramps	F E	Improves at-grade conflicts	Improves NB C/D [3] design	N/A
Berkeley St (Exit 122)	Queue spillback to Union. Outbound Fort Lewis to NB I-5.[1]	SB Ramps NB Ramps	C/ 32 C/ 26	B/ 17 A/ 9	*Same as Concept A	B/ 16
Thorne Ln (Exit 123)	Movements between I-5 & S-leg	SB Ramps NB Ramps	D/ 40[2]	- E/ 58[4]	D/ 40[2]	*Same as Concept C

1. Inbound Fort Lewis from SB I-5 is known to operate poorly during AM conditions.
2. Southbound and northbound ramps meet at a single-point urban interchange (SPUI).
3. C/D – Collector/Distributor lanes
4. Results for NB ramps are presented in *Transportation Needs Assessment* for the Woodbrook Businees Park Development Study. These results do *not* account for any increases associated with the Cross-Base Highway since Concept A would function only as a short-term improvement.

Next Steps

Following the December 3, 2009 TRC meeting, the project team will continue with the screening previous defined for the TRC. The Level 3 screening is much more detailed than the previous two. It measures several of the same items as the previous screening levels, but at a much more detailed level. This requires each of the remaining improvement concepts to be developed with a greater amount of detail in order to evaluate and analyze each as described by the metrics in Table 2.

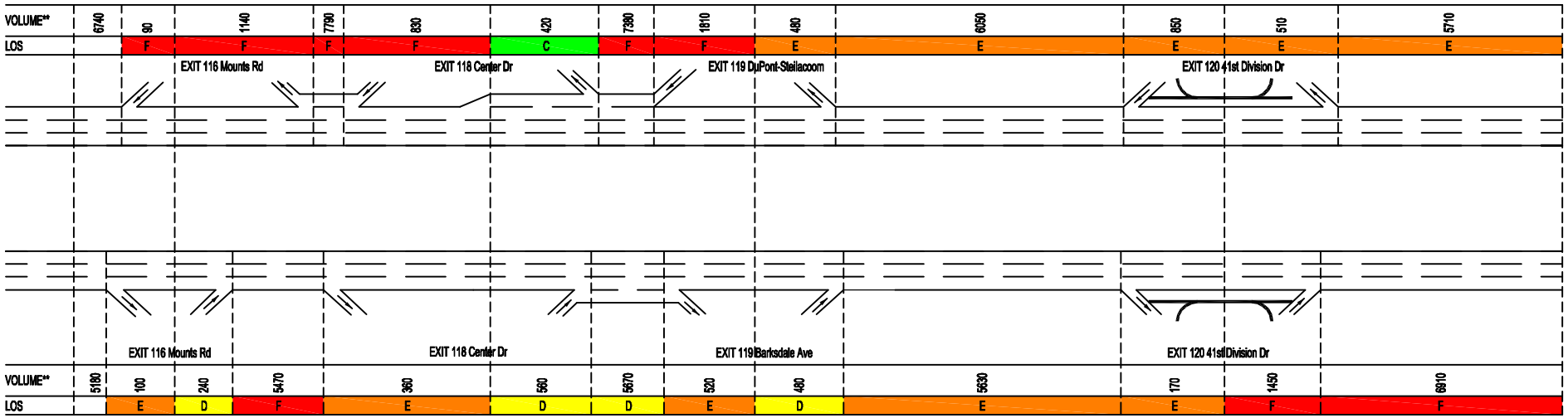
Table 2. Level 3 Screening Criteria

Broad Category[1]	Items to Evaluate[2]	Description of Metrics[3]
Preservation	• Does it improve geometric deficiencies? • Does it address old or aging infrastructure in need of replacement?	• Number of geometric deficiencies addressed • Remaining life (in # of years) of infrastructure
Safety	• What are the safety benefits it provides? • Does it address safety for all modes? • Does it improve at-grade rail crossings?	• Number and severity of collisions • Number of modes addressed
Mobility	• How well does it address a capacity problem and LOS standards for the freeway and local arterials? • How well does it reduce delays at interchanges & intersections? • Does it improve conditions for all modes? • How does it specifically benefit military needs? • Does it improve or worsen freeway operations?	• Mainline volume to capacity and LOS • Interchange / Intersection volume to capacity and LOS • Total delay • Vehicle merging and queuing • Gate access & operations • Percent military traffic served
Environment	• Does it impact sensitive areas? • Does it reduce vehicle delays (emissions)? • Does it impact a historic or cultural resource? • Does it impact any military installation perimeter?	• Amount and type of sensitive areas impacted • Number of historic or cultural resources impacted • Location and type of impact on military installation • Number and type of permits needed • Total vehicle delay
Stewardship	• Are the estimated costs proportional to the benefits? • Is it feasible from a construction staging perspective? • How well would it be supported by each jurisdiction? • Does it minimize right-of-way needs or property acquisition? • Is it consistent with local and regional plans?	• Estimated construction costs • Cost to benefit ratio • Amount of property to be displaced • Relative support from participating jurisdictions • Consistency with other plans

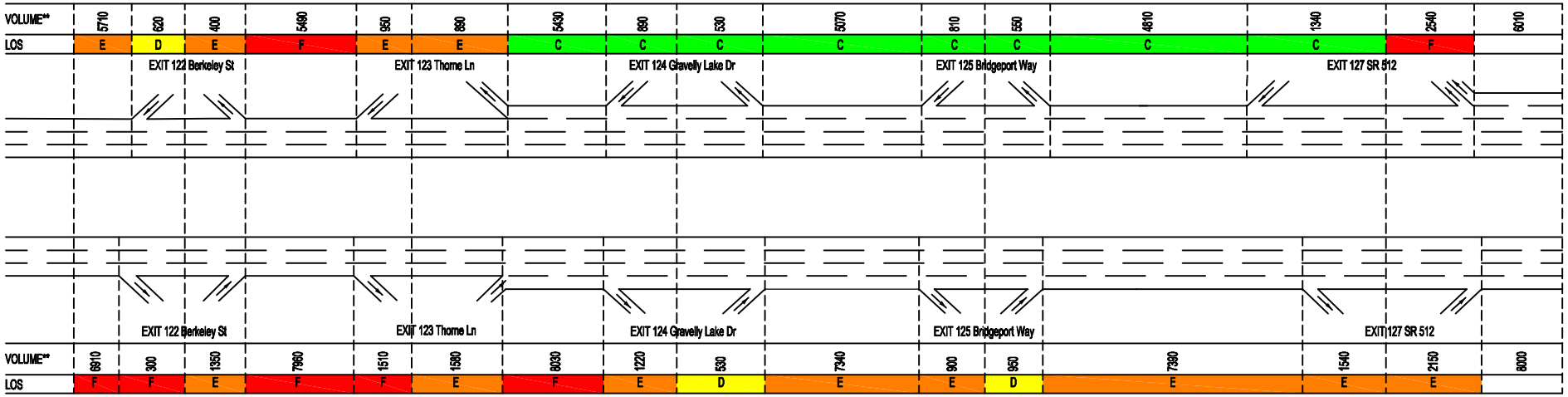
1. The broad categories are consistent and supportive with the WSDOT Washington Transportation Plan (WTP) statewide priority categories.
2. Types of questions to answer or investigate.
3. Metrics that would be used to prioritize the improvement options.

It is anticipated that the level of analysis for each alternative will yield a more benefit/cost type of comparative study. This comparative study will provide a prioritization of these concepts and lead to a refined set of alternative improvements.

Lakewood I-5: Exit 116-Exit 120



Lakewood I-5: Exit 122-127



2030 Baseline I-5 Mainline PM Peak Hour LOS Results

EXHIBIT

1

I-5 Transportation Alternative Analysis & Operations Model

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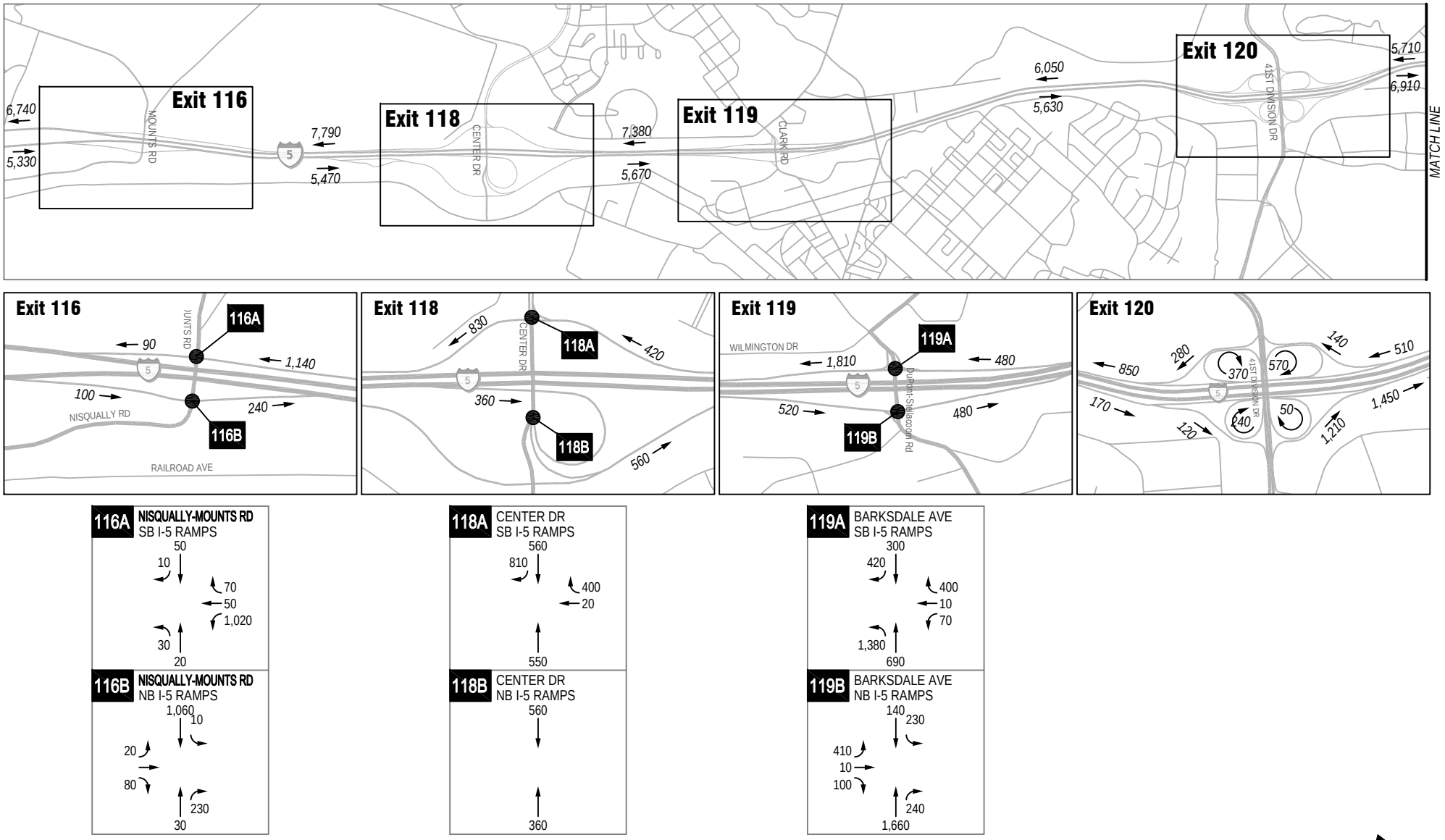

2030 PM Peak Hour Volumes (1 of 2)

I-5 Transportation Alternative Analysis & Operations Model

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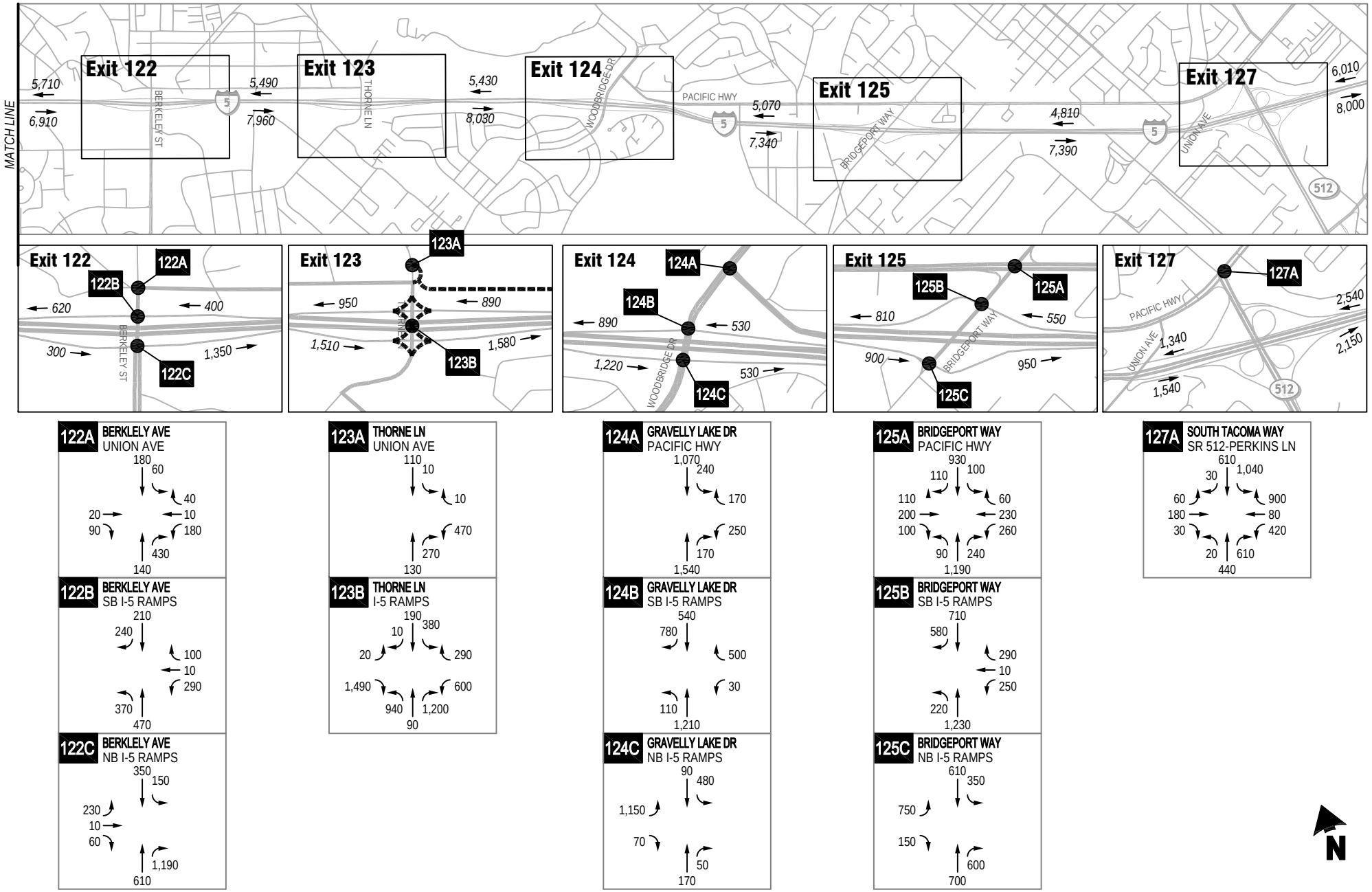
EXHIBIT

2A



2030 PM Baseline Peak Hour Volumes (2 of 2)

EXHIBIT

2B

I-5 Transportation Alternative Analysis & Operations Model

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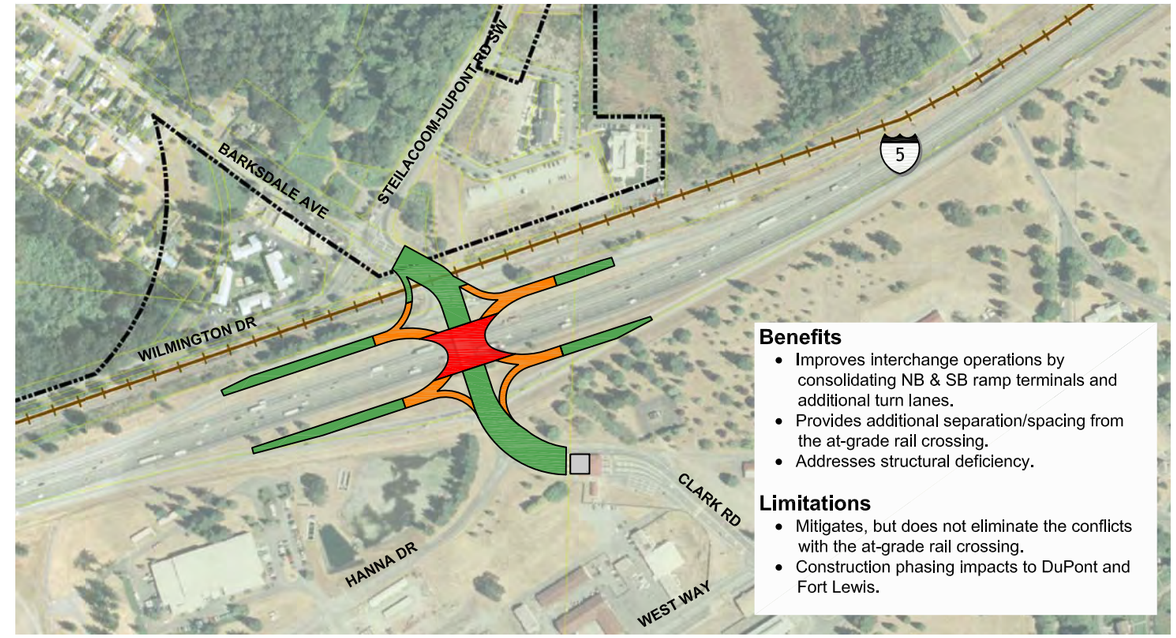
Exhibit 3 - DuPont-Steilacoom Road Interchange (Exit 119) Concepts

Interstate 5 Transportation Alternatives Analysis & Operations Model

Existing/Baseline Conditions & Deficiencies

- Gate traffic egress causes failure of interchange (NB & SB ramp terminals) due to the large number of vehicles from Fort Lewis heading south. This results in long outbound vehicle queues from Fort Lewis during the PM peak period.
- Close proximity to the at-grade rail crossing which is expected to have increases in rail activity, which will further impact the operational performance of the interchange.
- Overpass is structurally deficient.

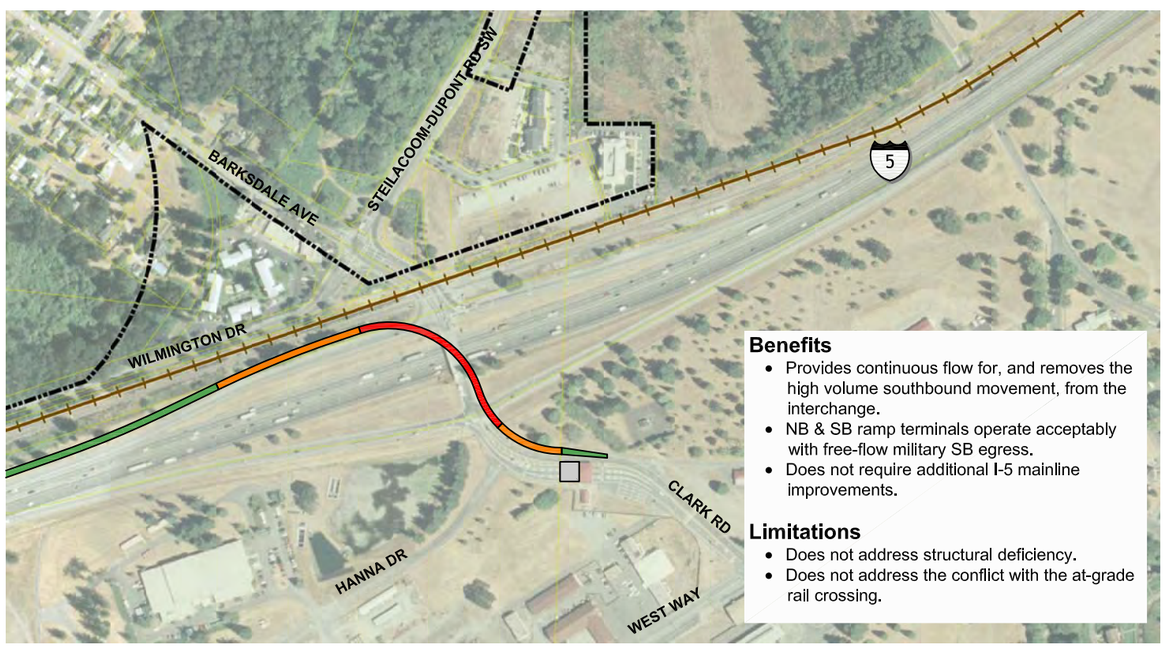


Concept B: Single-Point Urban Interchange

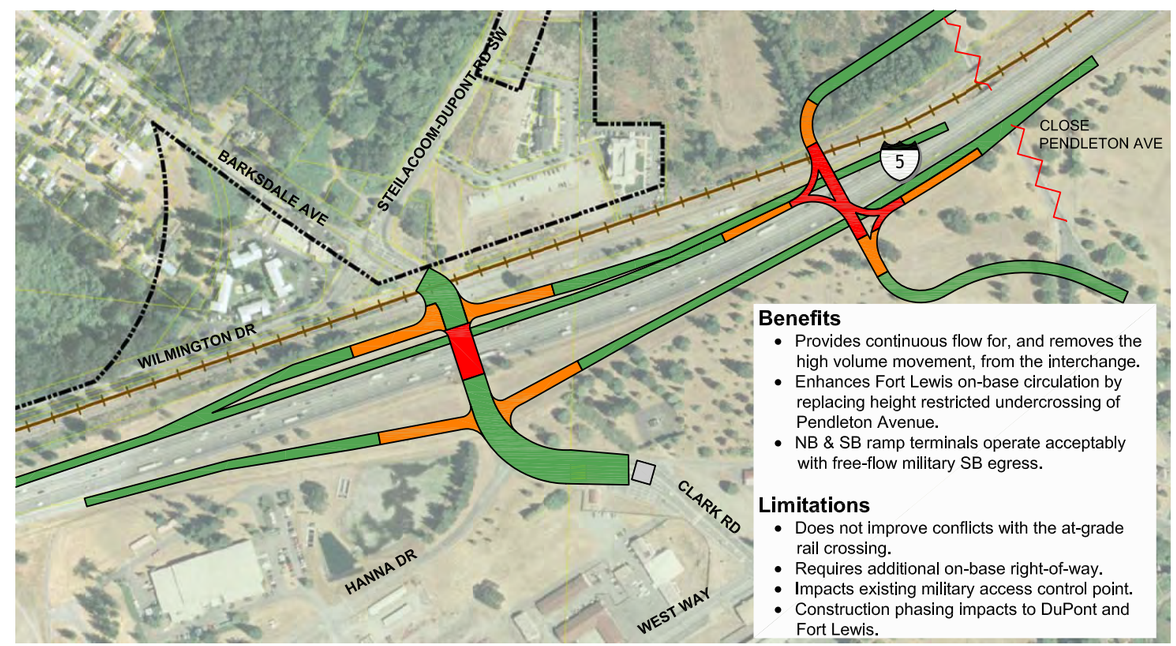
LEGEND

- ARTERIAL BRIDGE
- ELEVATED RAMP
- SURFACE IMPROVEMENTS
- MILITARY ACCESS CONTROL POINT

0 125 250 500 750 1,000 Feet



Concept A: Southbound Flyover On-Ramp



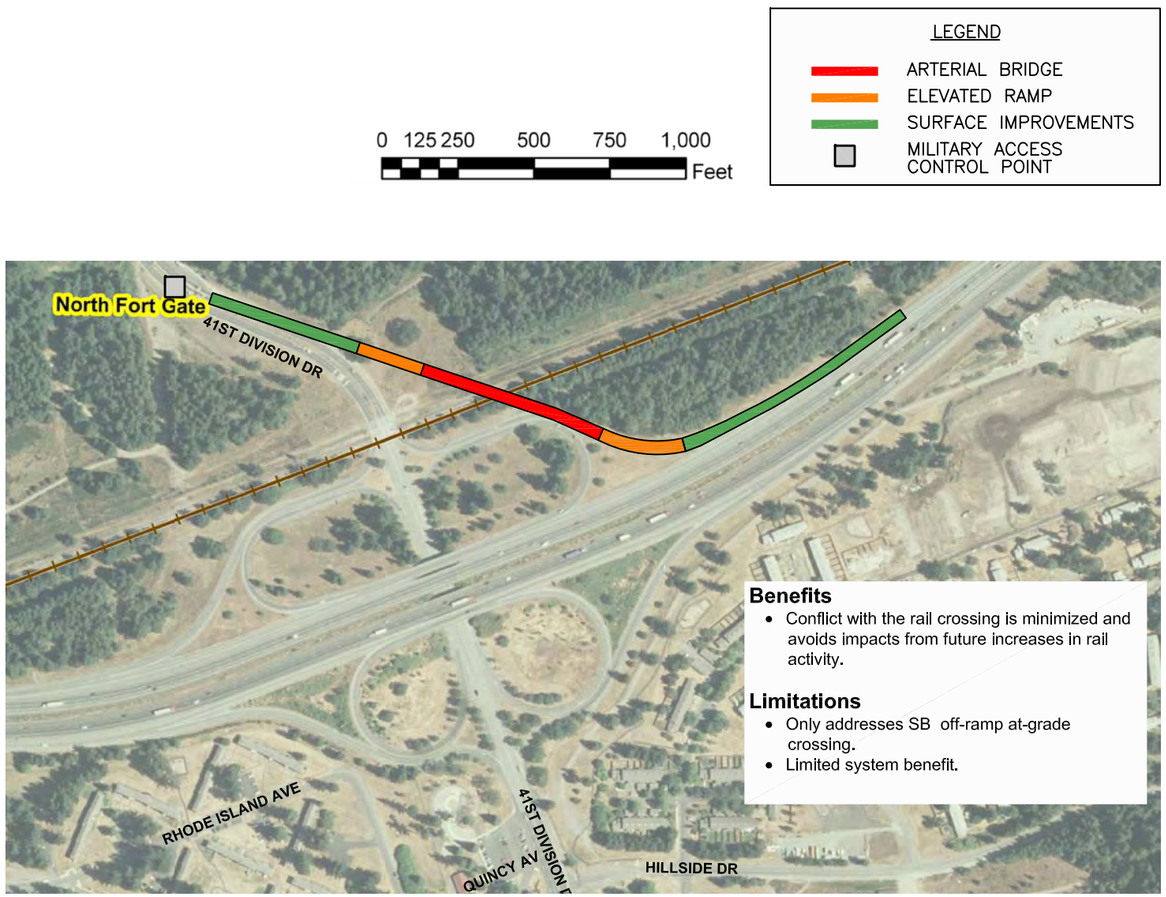
Concept C: New Direct Access Interchange/Collector - Distributor Lanes

Exhibit 4 - 41st Division Dr Interchange (Exit 120) Concepts

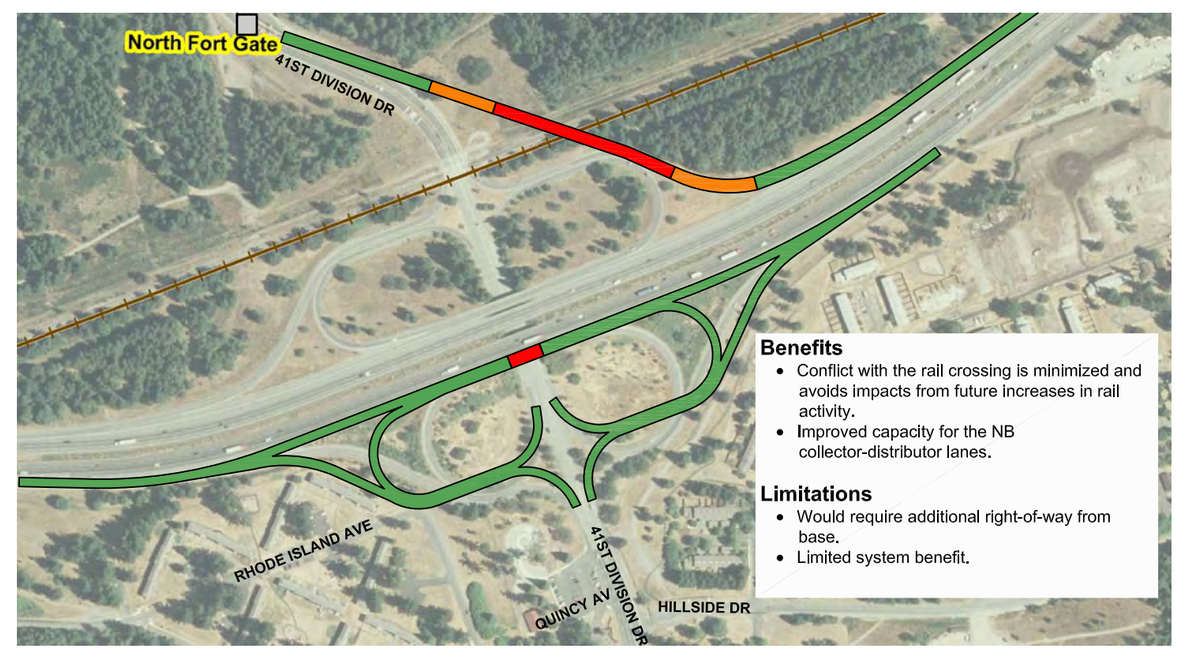
Interstate 5 Transportation Alternatives Analysis & Operations Model

Existing/Baseline Conditions & Deficiencies

- The SB I-5 to North Fort movement experiences congestion.
- The at-grade rail crossing will conflict with queues from the North Fort access gate and future increases in rail activity will degrade operations and vehicle queuing.
- Mainline congestion will create vehicle queuing onto the interchange on-ramps.



Concept A: Southbound Flyover



Concept B: Extended C-D Lanes

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Exhibit 5 - Berkeley St Interchange (Exit 122) Concepts

Interstate 5 Transportation Alternatives Analysis & Operations Model

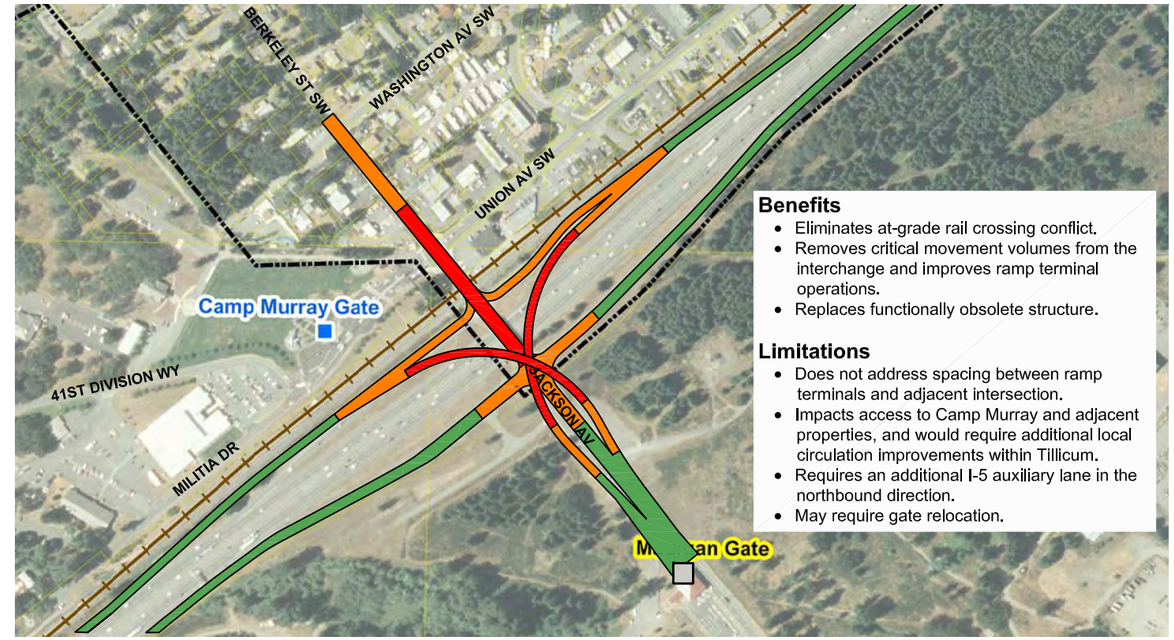
Existing/Baseline Conditions & Deficiencies

- Poor SB I-5 off-ramp (AM) and NB I-5 on-ramp (PM) operations (Queuing & vehicle delay).
- Close spacing between the ramps terminals, adjacent arterial intersection, and at-grade rail crossing.
- Queues extend onto Fort Lewis and into the Union St/Berkeley Ave interchange.
- Traffic regularly diverts through Tillicum neighborhood to bypass congestion at the interchange.
- Overpass is functionally obsolete.
- Mainline congestion creates excessive vehicle queuing onto the interchange on-ramps.

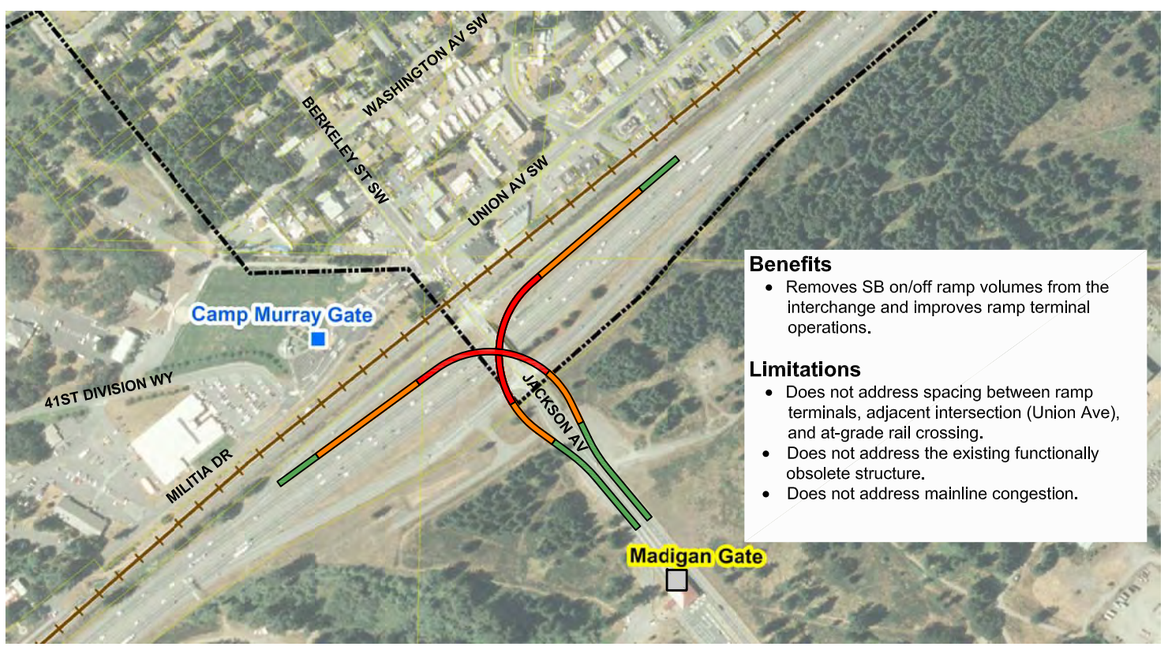
LEGEND

- ARTERIAL BRIDGE
- ELEVATED RAMP
- SURFACE IMPROVEMENTS
- MILITARY ACCESS CONTROL POINT

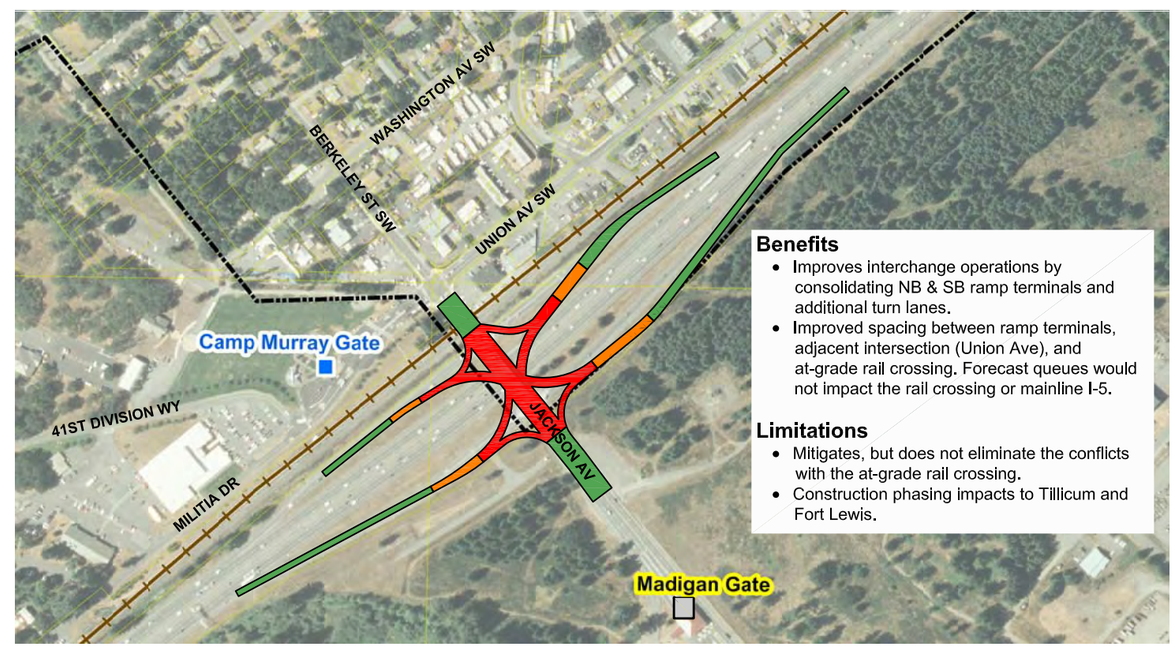
0 125 250 500 750 1,000 Feet



Concept B: Grade Separated Rail Crossing With Flyover



Concept A: Southbound Flyover On-Ramp



Concept C: SPUI

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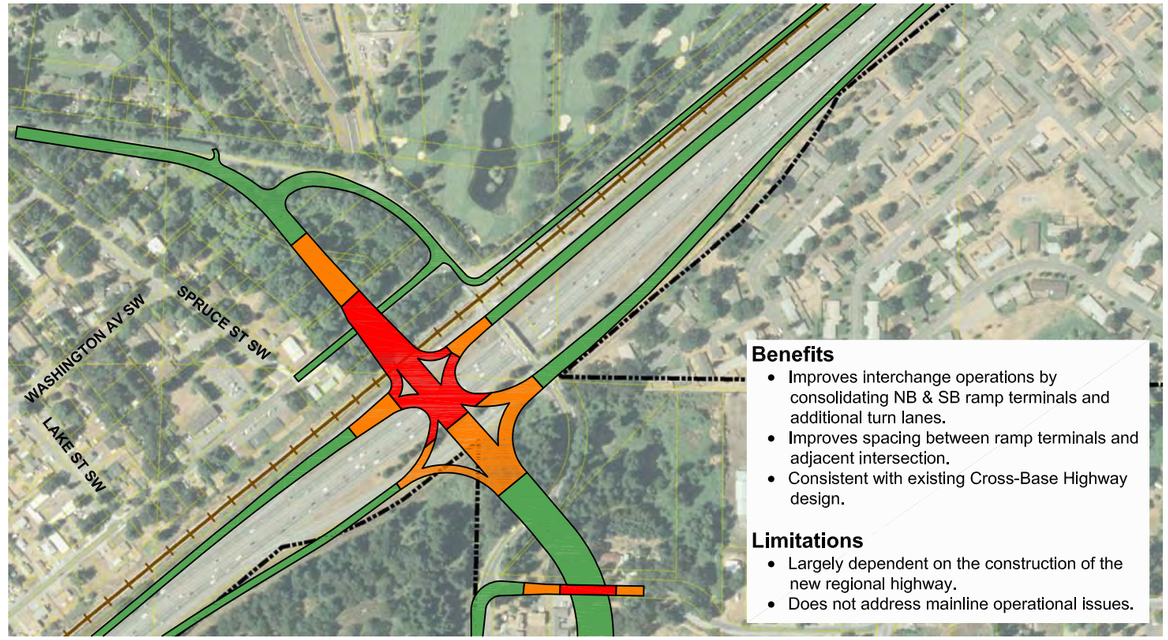
Exhibit 6 - Thorne Lane Interchange (Exit 123) Concepts

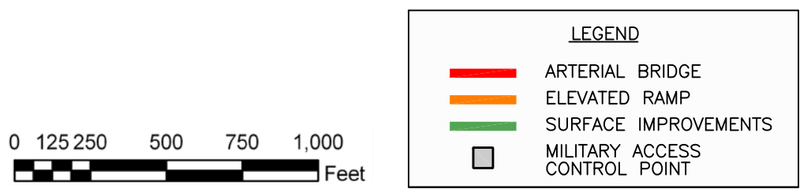
Interstate 5 Transportation Alternatives Analysis & Operations Model

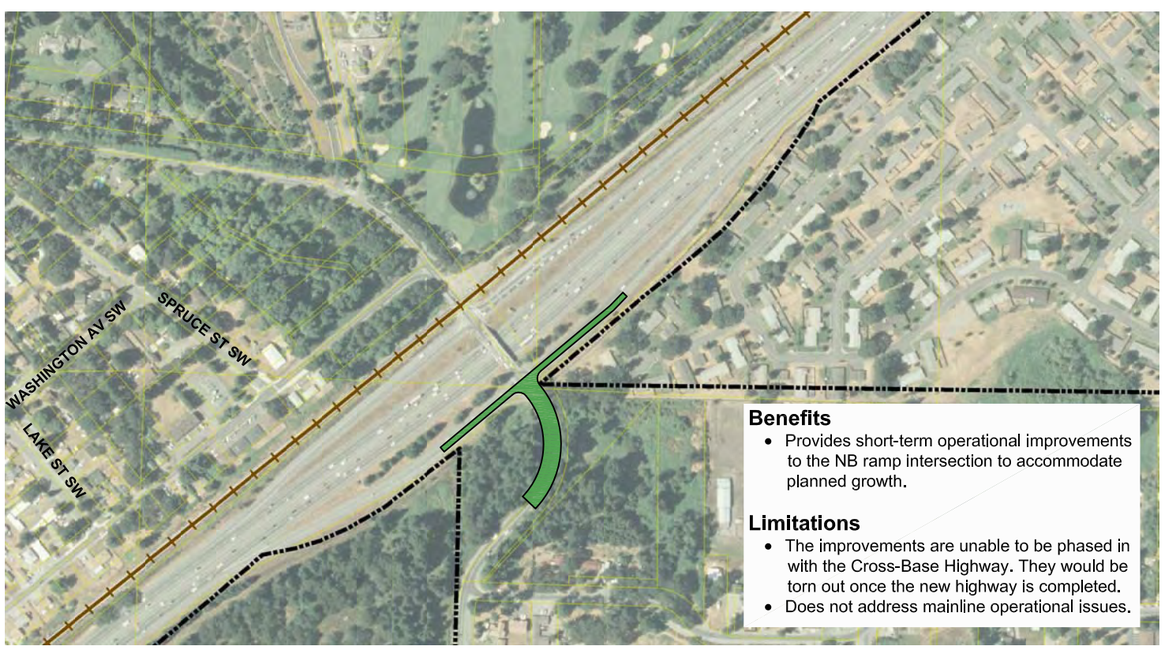
Existing/Baseline Conditions & Deficiencies

- Congestion and operational issues between Thorne Lane and Berkley Street due to a reduction in lanes from 4 to 3 and large on- and off-ramp vehicle movements.
- Overpass is functionally obsolete.

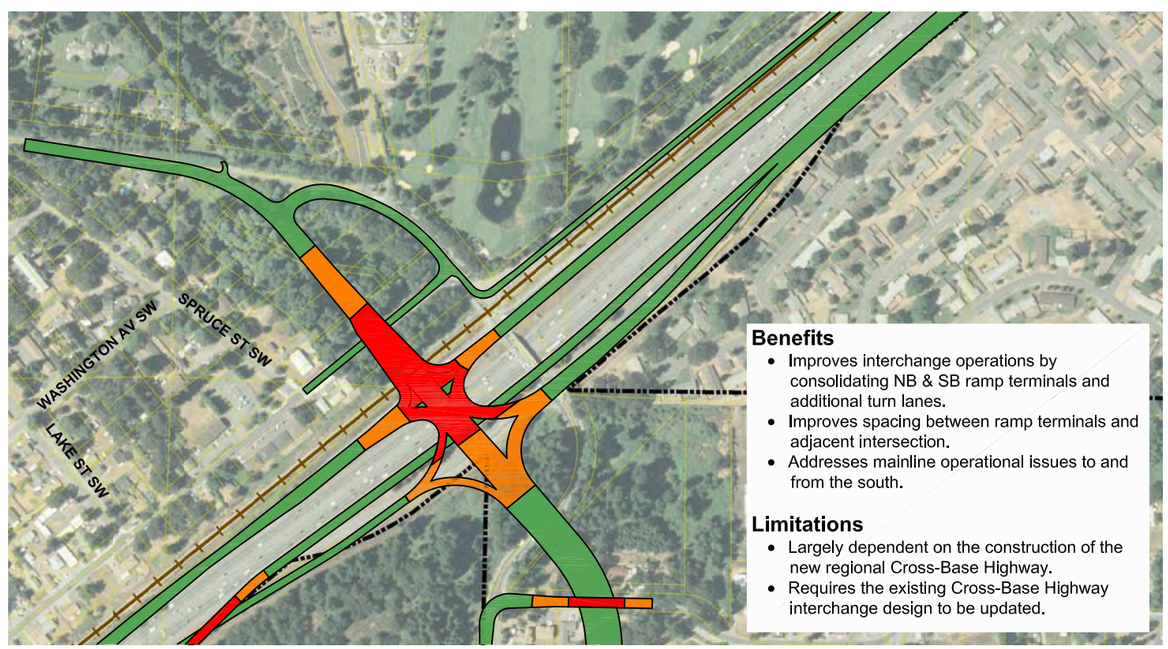


Concept B: Cross-Base SPUI & Frontage Road





Concept A: Northbound Ramp/Murrary Road



Concept C: Cross-Base SPUI with Braided Ramp

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